

Patent claims:

1. Radiation shielding arrangement for shielding neutron radiation and gamma radiation from particle  
5 accelerators, storage rings, target, experimental or analytical devices, comprising at least one shielding element made of a first material which contains bound water.
- 10 2. Radiation shielding arrangement according to claim 1, characterized in that the first material contains gypsum in the bound state in the chemical composition  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ .
- 15 3. Radiation shielding arrangement according to claim 3, characterized in that the shielding element comprises a gypsum wall.
- 20 4. Radiation shielding arrangement according to claim 3, characterized in that the gypsum wall has a thickness which is matched to the radiation spectra of a high-energy particle accelerator and/or high-energy particle storage ring for electrons, positrons or ions.
- 25 5. Radiation shielding arrangement according to claim 3, characterized in that the gypsum wall has a thickness which is greater than or equal to the secondary radiation equilibrium thickness, in particular a  
30 thickness of at least 2 m, at least 5 m or at least 7 m.

6. Radiation shielding arrangement according to claim 1,  
built in the form of a multilayer construction.
7. Radiation shielding arrangement according to claim 1,  
5 built in the form of a modular construction.
8. Radiation shielding arrangement according to claim 1,  
characterized by a loadbearing layer which is arranged  
on a first side of the shielding element and has at  
10 least a minimum thickness which is dimensioned such  
that the radiation shielding arrangement, in  
particular the arrangement of shielding element and  
loadbearing layer, is self-supporting.
- 15 9. Radiation shielding arrangement according to claim 1,  
characterized in that the loadbearing layer comprises  
concrete formwork.
- 20 10. Radiation shielding arrangement according to claim 1,  
characterized in that the shielding element is  
provided with formwork on both sides, in particular of  
concrete.
- 25 11. Radiation shielding arrangement according to claim 1,  
characterized by a neutron absorber layer which  
contains a neutron-absorbing material.
- 30 12. Radiation shielding arrangement according to claim 1,  
characterized by a neutron absorber layer which  
contains boron, cadmium and gadolinium.

13. Radiation shielding arrangement according to claim 1, characterized by a neutron absorber layer which contains boron-paraffin.
- 5 14. Radiation shielding arrangement according to claim 10, characterized in that the neutron absorber layer is arranged within the formwork or between the formwork and the gypsum wall.
- 10 15. Radiation shielding arrangement according to claim 8, characterized in that the loadbearing layer comprises a neutron-absorbing material.
- 15 16. Radiation shielding arrangement, for shielding neutron radiation and gamma radiation from particle accelerators, storage rings, target, experimental or analytical devices, comprising at least one spallation layer comprising a material which is characterized in that spallation reactions are triggered by means of
- 20 neutron irradiation.
17. Radiation shielding arrangement according to claim 16, characterized in that said material is a metal.
- 25 18. Use of gypsum from flue gas desulphurization plants for producing a radiation shielding arrangement for shielding neutron radiation and gamma radiation from high-energy particle accelerators, storage rings, target, experimental or analytical devices.
- 30 19. Use of a shielding element which contains gypsum for shielding radiation from a particle accelerator, a

particle storage ring, a target device, an  
experimental device or an analytical device.